



Dart Aerospace Ltd.  
1270 Aberdeen St  
Hawkesbury, ON  
K6A 1K7  
Canada

Tel (613) 632-5200

**D412-664-203TRN**  
**Job Sheet 168962**



Part No: D412-664-203TRN

Job Qty: 1 ea

Part Name: Crosstube Turning Detail



Part Weight: 0 lbs

Status: Scheduled

Priority: Medium

Job Created: 11/28/17

Job Tracking No:

Due Date: 12/8/17

DAS  
10  
9-89

Created By: Marie Lajeunesse

Type: Stock

Description:

Ship Via: *Aug D412664-243 Rev. F*

### Bill of Materials

### Job Routing

| Op No | Operation          | Qty   | Start Date | Due Date | Standard  |         | Workcenter/Supplier   |           | Sign-off     |
|-------|--------------------|-------|------------|----------|-----------|---------|-----------------------|-----------|--------------|
|       |                    |       |            |          | Setup hrs | Run Hrs | Workcenter / Supplier | Lead Time |              |
| 90    | Start up Operation | 1 Ea  |            | 12/7/17  | 0.00      | 0.00    | Start Up Crosstubes   |           | PMP          |
| 100   | Mori Seiki         | 1 pcs |            | 12/7/17  | 3.21      | 1.33    | Mori Seiki TL-40      |           | PMP          |
| 110   | QC                 | 1 pcs |            | 12/7/17  | 0.00      | 0.00    | QC2                   |           | PMP          |
| 120   | Mori Seiki         | 1 pcs |            | 12/7/17  | 0.00      | 1.67    | Mori Seiki TL-40      |           | PMP          |
| 130   | QC                 | 1 pcs |            | 12/7/17  | 0.00      | 0.00    | QC2                   |           | PMP          |
| 140   | QC                 | 1 pcs |            | 12/7/17  | 0.00      | 0.00    | QC8                   |           | PMP          |
| 145   | Crosstubes         | 1 pcs |            | 12/7/17  | 0.00      | 0.25    | Crosstube             |           | SA 18-03-07  |
| 150   | HandFXtube         | 1 pcs |            | 12/8/17  | 0.00      | 0.92    | HandFinish5           |           | OPZ          |
| 160   | QC                 | 1 pcs |            | 12/8/17  | 0.00      | 0.00    | QC7                   |           | OPZ          |
| 170   | Packaging          | 1 pcs |            | 12/8/17  | 0.00      | 0.00    | Packaging3            |           | OPZ          |
| 180   | QC21-SA            | 1 Ea  |            | 12/8/17  | 0.00      | 0.00    | QC21                  |           | cmr 18/03/21 |

Part Op 100 - 1-Fill tube with sand & install plugs 412-203 on both ends as per Folio FA166 2- Face both sides of tube 3-Turn first  
Descriptions: taper section on both side as per Folio FA166 4- blend transition lines using belt sander with 60 grit sandpaper  
120 - 1-Turn second taper on both sides as per Folio FA166 2- Blend transition lines using belt sander with 60 grit sandpaper. 3- Remove sand and plugs 4-Scribe part # and batch # using vibrating stilus  
145 - GRIND ONLY TRANSITION LINES SMOOTH LONGITUDE WAY.  
150 - 1- handfinish X-TUBE INSIDE AND OUT  
170 - LOCATION : LG014

### Job Allocations

| Operation             | Component Part | Required | Inventory | Allocated | Std Qty |
|-----------------------|----------------|----------|-----------|-----------|---------|
| 90-Start up Operation | D6009-129      | 1        | 107       | 0         | 0       |

*B123 972*

### Part Specifications

Specifications could not be found.

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

## WORK ORDER NON-CONFORMANCE / UPDATE



QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

Work Order update only ☐

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| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Suspected Unapproved <input type="checkbox"/> |  | <b>AGAINST DEPARTMENT/PROCESS</b><br><br>Skid-tube <input type="checkbox"/><br>Machining <input type="checkbox"/><br>Thermoforming <input type="checkbox"/><br>Large Fab <input type="checkbox"/>                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Cross tube <input type="checkbox"/> Water Jet <input type="checkbox"/> Engineering <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| <b>Root Cause</b><br><table style="width: 100%;"> <tr> <td style="width: 50%;">           Environment <input type="checkbox"/><br/>           Design <input type="checkbox"/><br/>           Doc/Data <input type="checkbox"/><br/>           Equip/Tooling <input type="checkbox"/><br/>           Handling/Pre <input type="checkbox"/><br/>           Material <input type="checkbox"/><br/>           Internal Transport <input type="checkbox"/><br/>           Tribal Knowledge <input type="checkbox"/><br/>           LOA <input type="checkbox"/><br/>           Substation <input type="checkbox"/><br/>           Past Expiry Date <input type="checkbox"/><br/>           Misidentified <input type="checkbox"/> </td> <td style="width: 50%;">           No Re-verification <input type="checkbox"/><br/>           Operator <input type="checkbox"/><br/>           Offset/Setup <input type="checkbox"/><br/>           Supplier <input type="checkbox"/><br/>           Training <input type="checkbox"/><br/>           Use for Testing <input type="checkbox"/><br/>           Poor Information <input type="checkbox"/><br/>           Rushing <input type="checkbox"/><br/>           Product Improvement <input type="checkbox"/><br/>           Process Improvement <input type="checkbox"/><br/>           Manufacturing Process <input type="checkbox"/><br/>           Past Due <input type="checkbox"/> </td> </tr> </table> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                              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type="checkbox"/><br>Manufacturing Process <input type="checkbox"/><br>Past Due <input type="checkbox"/> | <table style="width: 100%;"> <tr> <td style="width: 50%;">           Pressure/Forced <input type="checkbox"/><br/>           Bending <input type="checkbox"/><br/>           Centre Not Concentric <input type="checkbox"/><br/>           Cracks <input type="checkbox"/><br/>           Crimp/Kink/Ripple/Wave <input type="checkbox"/><br/>           Cuffs <input type="checkbox"/><br/>           Crushing <input type="checkbox"/><br/>           Heat Treat <input type="checkbox"/><br/>           Wave/Twist in Tube <input type="checkbox"/><br/>           Marks/Chatter <input type="checkbox"/> </td> <td style="width: 50%;">           Temperature/Cure <input type="checkbox"/><br/>           Set-up <input type="checkbox"/><br/>           BOM/Route <input type="checkbox"/><br/>           Broken/Damage/Defect <input type="checkbox"/><br/>           Inspection Incomplete/L <input type="checkbox"/><br/>           Contamination <input type="checkbox"/><br/>           Countersink <input type="checkbox"/><br/>           Cut Too Short <input type="checkbox"/><br/>           Instructions Incomplete, <input type="checkbox"/><br/>           Drill Holes <input type="checkbox"/> </td> </tr> </table> |  |  |  | Pressure/Forced <input type="checkbox"/><br>Bending <input type="checkbox"/><br>Centre Not Concentric <input type="checkbox"/><br>Cracks <input type="checkbox"/><br>Crimp/Kink/Ripple/Wave <input type="checkbox"/><br>Cuffs <input type="checkbox"/><br>Crushing <input type="checkbox"/><br>Heat Treat <input type="checkbox"/><br>Wave/Twist in Tube <input type="checkbox"/><br>Marks/Chatter <input type="checkbox"/> | Temperature/Cure <input type="checkbox"/><br>Set-up <input type="checkbox"/><br>BOM/Route <input type="checkbox"/><br>Broken/Damage/Defect <input type="checkbox"/><br>Inspection Incomplete/L <input type="checkbox"/><br>Contamination <input type="checkbox"/><br>Countersink <input type="checkbox"/><br>Cut Too Short <input type="checkbox"/><br>Instructions Incomplete, <input type="checkbox"/><br>Drill Holes <input type="checkbox"/> |
| Environment <input type="checkbox"/><br>Design <input type="checkbox"/><br>Doc/Data <input type="checkbox"/><br>Equip/Tooling <input type="checkbox"/><br>Handling/Pre <input type="checkbox"/><br>Material <input type="checkbox"/><br>Internal Transport <input type="checkbox"/><br>Tribal Knowledge <input type="checkbox"/><br>LOA <input type="checkbox"/><br>Substation <input type="checkbox"/><br>Past Expiry Date <input type="checkbox"/><br>Misidentified <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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**PART NO: D412-664-203TRN**  
**Original Serial #: S032122**  
**Revision:**  
**Operation: Start up Operation 01/15/18**  
**Change No:**

Job No: 168962

Cross tube Turning Detail



**S032122**

1270 Aberdeen Street  
 Hawkesbury, ON K64 1K7  
 CANADA  
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 www.dartaerospace.com



|                                                       |                     |              |
|-------------------------------------------------------|---------------------|--------------|
| <b>DART AEROSPACE LTD</b>                             | <b>Work Order:</b>  | 168962       |
| <b>Description:</b> Crosstube Assembly (412 High Aft) | <b>Part Number:</b> | D412-664-243 |
| <b>Inspection Dwg:</b> D412-664-243 Rev: F            |                     | Page 1 of 2  |

### FIRST ARTICLE INSPECTION CHECKLIST

|        | Inspection Sheet<br>Drawing Dimension | Tolerance     | Actual<br>Dimension | Accept | Reject | Method of<br>Inspection | Comments |
|--------|---------------------------------------|---------------|---------------------|--------|--------|-------------------------|----------|
| SIDE A | 2.684                                 | +0.005/-0.000 | 2.689               | ✓      |        | BL MIC 2"-3"            |          |
|        | 2.748                                 | +0.005/-0.000 | 2.753               | ✓      |        | "                       |          |
|        | 2.884                                 | +0.005/-0.000 | 2.889               | ✓      |        | "                       |          |
|        | 3.019                                 | +0.005/-0.000 | 3.024               | ✓      |        | BL MIC 3"-4"            |          |
|        | 3.163                                 | +0.005/-0.000 | 3.168               | ✓      |        | "                       |          |
|        | 3.308                                 | +0.005/-0.000 | 3.313               | ✓      |        | "                       |          |
|        | 3.429                                 | +0.005/-0.000 | 3.434               | ✓      |        | "                       |          |
|        | 2.990                                 | +0.005/-0.000 | 2.994               | ✓      |        | VERN 08                 |          |
|        | 2.618                                 | +0.005/-0.000 | 2.623               | ✓      |        | BL MIC 2"-3"            |          |
|        | 0.200                                 | +/-0.010      | .196                | ✓      |        | VERN 08                 |          |
|        | R0.063                                | +/-0.010      | .063                | ✓      |        | RG                      |          |
|        | R0.500                                | +/-0.010      | .500                | ✓      |        | RG                      |          |
|        | 4.971                                 | +/-0.030      | 4.990               | ✓      |        | VERN 08                 |          |
|        |                                       |               |                     |        |        |                         |          |
| SIDE B | 2.684                                 | +0.005/-0.000 | 2.689               | ✓      |        | BL MIC 2"-3"            |          |
|        | 2.748                                 | +0.005/-0.000 | 2.753               | ✓      |        | "                       |          |
|        | 2.884                                 | +0.005/-0.000 | 2.889               | ✓      |        | "                       |          |
|        | 3.019                                 | +0.005/-0.000 | 3.024               | ✓      |        | BL MIC 3"-4"            |          |
|        | 3.163                                 | +0.005/-0.000 | 3.168               | ✓      |        | "                       |          |
|        | 3.308                                 | +0.005/-0.000 | 3.313               | ✓      |        | "                       |          |
|        | 3.429                                 | +0.005/-0.000 | 3.434               | ✓      |        | "                       |          |
|        | 2.990                                 | +0.005/-0.000 | 2.994               | ✓      |        | VERN 08                 |          |
|        | 2.618                                 | +0.005/-0.000 | 2.623               | ✓      |        | BL MIC 2"-3"            |          |
|        | 0.200                                 | +/-0.010      | .202                | ✓      |        | VERN 08                 |          |
|        | R0.063                                | +/-0.010      | .063                | ✓      |        | RG                      |          |
|        | R0.500                                | +/-0.010      | .500                | ✓      |        | RG                      |          |
|        | 4.971                                 | +/-0.030      | 4.996               | ✓      |        | VERN 08                 |          |
|        | 124.100                               | +/-0.020      | 124.100             | ✓      |        | TAPE                    |          |

DQA: \_\_\_\_\_ Date: \_\_\_\_\_

## WORK ORDER NON-CONFORMANCE / UPDATE



QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

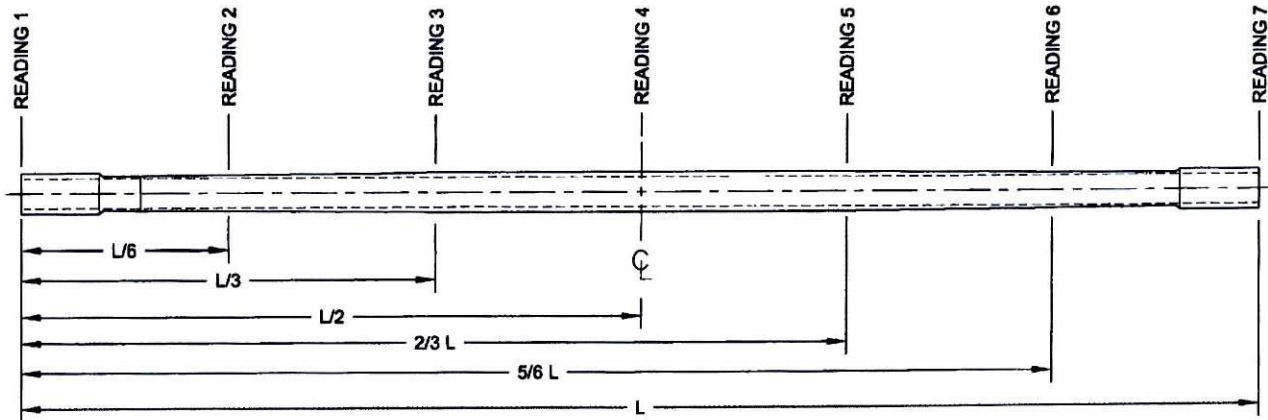
Work Order update only ☐

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| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Suspected Unapproved <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                      | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>             Skid-tube <input type="checkbox"/><br/>             Machining <input type="checkbox"/><br/>             Thermoforming <input type="checkbox"/><br/>             Large Fab <input type="checkbox"/> </div> <div>             Cross tube <input type="checkbox"/><br/>             Small Fab <input type="checkbox"/><br/>             Finishing <input type="checkbox"/><br/>             Composite <input type="checkbox"/> </div> <div>             Water Jet <input type="checkbox"/><br/>             Prod. Eng. Coord. <input type="checkbox"/><br/>             Rec/Store/Packaging <input type="checkbox"/><br/>             Supplier <input type="checkbox"/> </div> <div>             Engineering <input type="checkbox"/><br/>             Quality <input type="checkbox"/><br/>             Other <input type="checkbox"/> </div> </div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                 |  |
| Date :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Step #:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | QTY Effective :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   | MRB (QSI042) Approval                           |  |
| Description Work Order Deviation                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Disposition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   | Completed By                                    |  |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                 |  |
| Root Cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | FAULT CATEGORY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                 |  |
| Environment <input type="checkbox"/><br>Design <input type="checkbox"/><br>Doc/Data <input type="checkbox"/><br>Equip/Tooling <input type="checkbox"/><br>Handling/Pre <input type="checkbox"/><br>Material <input type="checkbox"/><br>Internal Transport <input type="checkbox"/><br>Tribal Knowledge <input type="checkbox"/><br>LOA <input type="checkbox"/><br>Substation <input type="checkbox"/><br>Past Expiry Date <input type="checkbox"/><br>Misidentified <input type="checkbox"/> | No Re-verification <input type="checkbox"/><br>Operator <input type="checkbox"/><br>Offset/Setup <input type="checkbox"/><br>Supplier <input type="checkbox"/><br>Training <input type="checkbox"/><br>Use for Testing <input type="checkbox"/><br>Poor Information <input type="checkbox"/><br>Rushing <input type="checkbox"/><br>Product Improvement <input type="checkbox"/><br>Process Improvement <input type="checkbox"/><br>Manufacturing Process <input type="checkbox"/><br>Past Due <input type="checkbox"/> | Pressure/Forced <input type="checkbox"/><br>Bending <input type="checkbox"/><br>Centre Not Concentric <input type="checkbox"/><br>Cracks <input type="checkbox"/><br>Crimp/Kink/Ripple/Wave <input type="checkbox"/><br>Cuffs <input type="checkbox"/><br>Crushing <input type="checkbox"/><br>Heat Treat <input type="checkbox"/><br>Wave/Twist in Tube <input type="checkbox"/><br>Marks/Chatter <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Temperature/Cure <input type="checkbox"/><br>Set-up <input type="checkbox"/><br>BOM/Route <input type="checkbox"/><br>Broken/Damage/Defect <input type="checkbox"/><br>Inspection Incomplete/Unqualified <input type="checkbox"/><br>Contamination <input type="checkbox"/><br>Countersink <input type="checkbox"/><br>Cut Too Short <input type="checkbox"/><br>Instructions Incomplete/Unclear <input type="checkbox"/><br>Drill Holes <input type="checkbox"/> | Power Loss/Surge <input type="checkbox"/><br>Folio/Program <input type="checkbox"/><br>Grain <input type="checkbox"/><br>Weld <input type="checkbox"/><br>Wrong Stock Pulled <input type="checkbox"/><br>Out of Sequence <input type="checkbox"/><br>Off-set <input type="checkbox"/><br>Misabeled <input type="checkbox"/><br>Fit/Function <input type="checkbox"/><br>Misaligned/off center <input type="checkbox"/> | Positioned Wrong <input type="checkbox"/><br>Outside Dimensions <input type="checkbox"/><br>Over/Under tolerance <input type="checkbox"/><br>Part Incorrect <input type="checkbox"/><br>Part Lost/Missing <input type="checkbox"/><br>Part Moved <input type="checkbox"/><br>Drawing <input type="checkbox"/><br>Finish <input type="checkbox"/><br>Misread <input type="checkbox"/><br>Turning Sequence <input type="checkbox"/> | OTHER : _____                                   |  |



|                                                       |                                  |
|-------------------------------------------------------|----------------------------------|
| <b>DART AEROSPACE LTD</b>                             | <b>Work Order:</b> 168962        |
| <b>Description:</b> Crosstube Assembly (412 High Aft) | <b>Part Number:</b> D412-664-243 |
| <b>Inspection Dwg:</b> D412-664-243 <b>Rev:</b> F     | <b>Page 2 of 2</b>               |

### WALL THICKNESS MEASUREMENT



| Location                  | WALL THICKNESS MEASUREMENT (IN) |     |     |     | Deviation $\Delta w$<br>(max-min) | TOLERANCE |
|---------------------------|---------------------------------|-----|-----|-----|-----------------------------------|-----------|
|                           | w1                              | w2  | w3  | w4  |                                   |           |
| READING 1<br>$L = 0"$     | 358                             | 360 | 383 | 382 | .025                              | 0.073"    |
| READING 2<br>$L = 20.68$  | 317                             | 290 | 302 | 331 | .041                              |           |
| READING 3<br>$L = 41.37$  | 484                             | 460 | 471 | 494 | .034                              |           |
| READING 4<br>$L = 62.05$  | 627                             | 620 | 635 | 637 | .015                              |           |
| READING 5<br>$L = 82.73$  | 471                             | 472 | 482 | 482 | .011                              |           |
| READING 6<br>$L = 103.42$ | 306                             | 290 | 314 | 329 | .039                              |           |
| READING 7<br>$L = 124.1$  | 373                             | 370 | 372 | 373 | .003                              |           |

#### Calibration Result

Actual Block Thickness: 100-750

SITESCAN 250 Measured Thickness: 100-750

|                         |                       |                              |
|-------------------------|-----------------------|------------------------------|
| <b>Measured by:</b> PMP | <b>Audited by:</b> JW | <b>Preliminary Approval:</b> |
| <b>Date:</b> 2018-01-15 | <b>Date:</b> 18-02-27 | <b>Date:</b>                 |

| Rev | Date     | Change                                | Revised by | Approved |
|-----|----------|---------------------------------------|------------|----------|
| A   | 04.06.16 | New Issue (P/O D412-664-203)          | KJ/JLM     |          |
| B   | 06.03.09 | Dwg Rev updated                       | KJ/JLM     |          |
| C   | 07.05.08 | Tolerance updated for dimension 4.971 | KJ/JLM     |          |
| D   | 10.02.02 | Dimension 124.100 was 124.09          | KJ         |          |
| E   | 12.06.04 | Wall thickness form added             | KJ         |          |
| F   | 14.06.24 | Dwg Rev updated                       | KJ         |          |

DQA: \_\_\_\_\_ Date: \_\_\_\_\_



## WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

Work Order update only ☐

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| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Suspected Unapproved <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                      | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Cross tube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Date :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Step #:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | QTY Effective :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MRB (QSI042) Approval                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Description Work Order Deviation                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Disposition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Completed By                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | QC / QA Coordinator Approval                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| Root Cause                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | FAULT CATEGORY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Environment <input type="checkbox"/><br>Design <input type="checkbox"/><br>Doc/Data <input type="checkbox"/><br>Equip/Tooling <input type="checkbox"/><br>Handling/Pre <input type="checkbox"/><br>Material <input type="checkbox"/><br>Internal Transport <input type="checkbox"/><br>Tribal Knowledge <input type="checkbox"/><br>LOA <input type="checkbox"/><br>Substation <input type="checkbox"/><br>Past Expiry Date <input type="checkbox"/><br>Misidentified <input type="checkbox"/> | No Re-verification <input type="checkbox"/><br>Operator <input type="checkbox"/><br>Offset/Setup <input type="checkbox"/><br>Supplier <input type="checkbox"/><br>Training <input type="checkbox"/><br>Use for Testing <input type="checkbox"/><br>Poor Information <input type="checkbox"/><br>Rushing <input type="checkbox"/><br>Product Improvement <input type="checkbox"/><br>Process Improvement <input type="checkbox"/><br>Manufacturing Process <input type="checkbox"/><br>Past Due <input type="checkbox"/> | Pressure/Forced <input type="checkbox"/><br>Bending <input type="checkbox"/><br>Centre Not Concentric <input type="checkbox"/><br>Cracks <input type="checkbox"/><br>Crimp/Kink/Ripple/Wave <input type="checkbox"/><br>Cuffs <input type="checkbox"/><br>Crushing <input type="checkbox"/><br>Heat Treat <input type="checkbox"/><br>Wave/Twist in Tube <input type="checkbox"/><br>Marks/Chatter <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Temperature/Cure <input type="checkbox"/><br>Set-up <input type="checkbox"/><br>BOM/Route <input type="checkbox"/><br>Broken/Damage/Defect <input type="checkbox"/><br>Inspection Incomplete/Unqualified <input type="checkbox"/><br>Contamination <input type="checkbox"/><br>Countersink <input type="checkbox"/><br>Cut Too Short <input type="checkbox"/><br>Instructions Incomplete/Unclear <input type="checkbox"/><br>Drill Holes <input type="checkbox"/> | Power Loss/Surge <input type="checkbox"/><br>Folio/Program <input type="checkbox"/><br>Grain <input type="checkbox"/><br>Weld <input type="checkbox"/><br>Wrong Stock Pulled <input type="checkbox"/><br>Out of Sequence <input type="checkbox"/><br>Off-set <input type="checkbox"/><br>Misabeled <input type="checkbox"/><br>Fit/Function <input type="checkbox"/><br>Misaligned/off center <input type="checkbox"/> | Positioned Wrong <input type="checkbox"/><br>Outside Dimensions <input type="checkbox"/><br>Over/Under tolerance <input type="checkbox"/><br>Part Incorrect <input type="checkbox"/><br>Part Lost/Missing <input type="checkbox"/><br>Part Moved <input type="checkbox"/><br>Drawing <input type="checkbox"/><br>Finish <input type="checkbox"/><br>Misread <input type="checkbox"/><br>Turning Sequence <input type="checkbox"/> |
| OTHER : <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                   |



| Item | Qty<br>-243 | Part Number       | Description                       |
|------|-------------|-------------------|-----------------------------------|
| 1    | X           | D412-664-243      | CROSSTUBE ASSEMBLY (412 HIGH AFT) |
| 2    | 1           | D6009-129         | CROSSTUBE                         |
| 3    | 2           | D3595-063-570     | RUBBER CUSHION                    |
| 4    | 1           | D2896-1           | SUPPORT                           |
| 5    | 2           | D3189-1           | CHAFING SHIELD                    |
| 7    | 4           | MS21920-28        | CLAMP                             |
| 8    | 2           | MS21920-30        | CLAMP (OR MS21920-32)             |
| 9    | A/R         | SCOTCH-WELD DP460 | EPOXY ADHESIVE, 3M SCOTCH-WELD    |
| 10   | A/R         | PROSEAL 890 B-2   | SEALANT                           |

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6009-129  
FINISHED LENGTH = 124.100±0.020 (BEFORE BENDING)
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (ZN C6-2, HATCHED AREA)  
PAINT OUTSIDE PER DART QSI 005 4.2  
AFTER PAINTING, REMOVE MASKING AND APPLY MATTE CLEAR COAT
- 3) TOLERANCES: PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART P/N 'D412-664-243' AND B/N ON INSIDE OF CUFF PER QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 47.0 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE.
- 9) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. DO NOT GRIND TUBE AFTER SHOT PEEN.

#### TURNING

- 10) WHEN TRANSITIONING TO STOCK MAT'L, RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALLY. TRANSITION SHOULD BE SMOOTH.

#### BENDING

- 11) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 7% (BASED ON O.D.) IN LOWER HALF OF R30 BEND AND 6% (BASED ON O.D.) ON REMAINING TUBE.
- 12) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038. TO BE PERFORMED AFTER FINAL POST-BEND GRINDING. ANY ADDITIONAL GRINDING REQUIRES ANOTHER LPI INSPECTION.

#### ASSEMBLY

- 13) INSTALL D2896-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 015.
- 14) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE THE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE ON TOP SIDE OF CROSSTUBE.
- 15) APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D3189-1 CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL PROSEALED D3189-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.
- 16) TORQUE CLAMPS ON D2896-1 SUPPORT 80 TO 100 IN-LB. TORQUE CLAMPS ON D3189-1 CHAFING SHIELD 40 TO 50 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVES HAVE CURED FOR 24 HOURS.

SHOP COPY  
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UNCONTROLLED COPY  
SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. 168962M5  
17-11-28

RELEASED  
2014-05-26

|                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                              |    |          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----------|
| F                                                                                                                                                                                                                                                                                                                                                                                                                                               | NOTES RE-ORDERED, SCOTCH-WELD WAS MAGNOBOND (C8-1). ADD CLAMP RETORQUE (A8-1), REMOVE ABRASION STRIP, ADD INSPECTION WINDOW (C8-1), CHAFING SHIELD NOW 4.38 WIDE (C6-2). ADD 7% CRUSHING (B8-1), CHG BEND HEIGHT TOL TO ±0.25 (C1-3), CHG CUFF TOL (D2-4), CLAMPS FLIPPED TO PREVENT CHAFING (B7-2, B7-3). INCORP. DEO E-2/4 | CP | 14.04.01 |
| E                                                                                                                                                                                                                                                                                                                                                                                                                                               | REFORMAT/REVISE GENERAL NOTES: REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); ADD TOLERANCE (ZN B6-3, C4-3, C8-3 & C5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4.                                                                                  | RF | 09.09.30 |
| D                                                                                                                                                                                                                                                                                                                                                                                                                                               | REMOVE D2732-058, CHANGE TO D3595-063-570                                                                                                                                                                                                                                                                                    | PH | 07.03.09 |
| C                                                                                                                                                                                                                                                                                                                                                                                                                                               | REMOVE D2856-800-1087, ADD D2732-058 & MAGNOBOND 6398, MS21920-32 WAS MS21920-30                                                                                                                                                                                                                                             | MB | 06.10.27 |
| B                                                                                                                                                                                                                                                                                                                                                                                                                                               | ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES                                                                                                                                                                                                                                                                            | PH | 05.02.04 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                               | NEW ISSUE                                                                                                                                                                                                                                                                                                                    | PH | 01.10.17 |
| REV.                                                                                                                                                                                                                                                                                                                                                                                                                                            | DESCRIPTION                                                                                                                                                                                                                                                                                                                  | BY | DATE     |
| DESIGN                                                                                                                                                                                                                                                                                                                                                                                                                                          | qp                                                                                                                                                                                                                                                                                                                           |    |          |
| DRAWN                                                                                                                                                                                                                                                                                                                                                                                                                                           | qp                                                                                                                                                                                                                                                                                                                           |    |          |
| CHECKED                                                                                                                                                                                                                                                                                                                                                                                                                                         | DW                                                                                                                                                                                                                                                                                                                           |    |          |
| MFG. APPR.                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2/2                                                                                                                                                                                                                                                                                                                          |    |          |
| APPROVED                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2/2                                                                                                                                                                                                                                                                                                                          |    |          |
| DE APPR.                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2/2                                                                                                                                                                                                                                                                                                                          |    |          |
| DATE                                                                                                                                                                                                                                                                                                                                                                                                                                            | 14.04.01                                                                                                                                                                                                                                                                                                                     |    |          |
| <b>DART AEROSPACE LTD</b><br>HAWKESBURY, ONTARIO, CANADA<br>DRAWING NO. D412-664-243<br>REV. F<br>SHEET 1 OF 4<br>TITLE CROSSTUBE ASSEMBLY (412 HI AFT)<br>SCALE NTS<br>COPYRIGHT © 2001 BY DART AEROSPACE LTD<br>THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD |                                                                                                                                                                                                                                                                                                                              |    |          |

DQA: \_\_\_\_\_ Date: \_\_\_\_\_



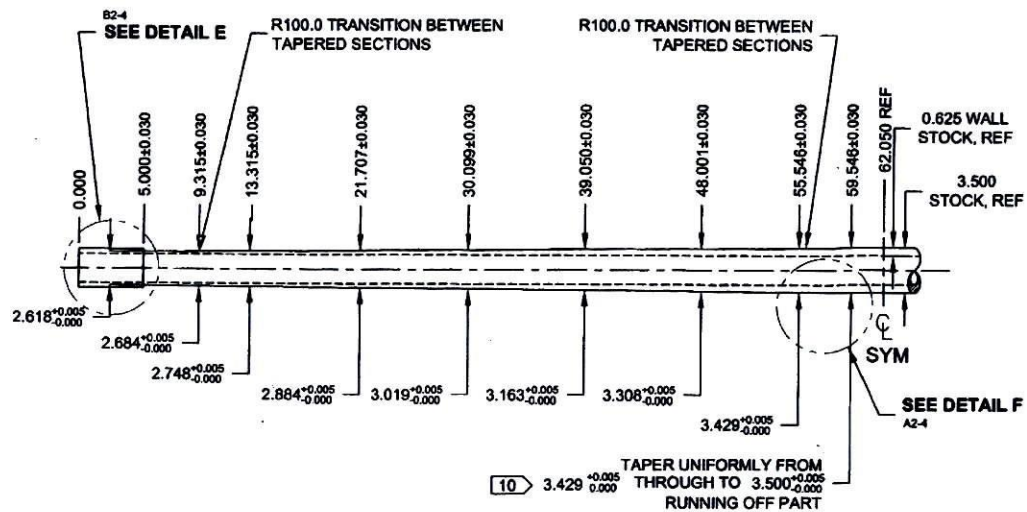
## WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

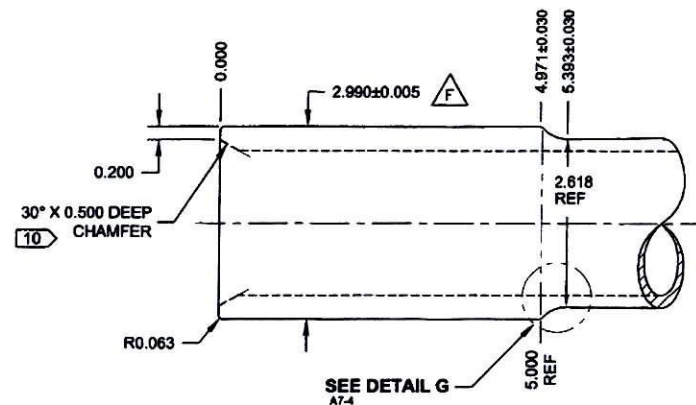
Work Order update only ☐

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| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Suspected Unapproved <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>             Skid-tube <input type="checkbox"/><br/>             Machining <input type="checkbox"/><br/>             Thermoforming <input type="checkbox"/><br/>             Large Fab <input type="checkbox"/> </div> <div>             Cross tube <input type="checkbox"/><br/>             Small Fab <input type="checkbox"/><br/>             Finishing <input type="checkbox"/><br/>             Composite <input type="checkbox"/> </div> <div>             Water Jet <input type="checkbox"/><br/>             Prod. Eng. Coord. <input type="checkbox"/><br/>             Rec/Store/Packaging <input type="checkbox"/><br/>             Supplier <input type="checkbox"/> </div> <div>             Engineering <input type="checkbox"/><br/>             Quality <input type="checkbox"/><br/>             Other <input type="checkbox"/> </div> </div> |  |  |                                                                                                                                                                           |  |  |
| Date :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  | Step #:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  | QTY Effective :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  | <b>MRB (QSI042) Approval</b><br><br><br><b>Completed By</b><br><br><br><b>Lead hand / Supervisor Approval Verification</b><br><br><br><b>QC / QA Coordinator Approval</b> |  |  |
| Description Work Order Deviation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  | Disposition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |                                                                                                                                                                           |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |                                                                                                                                                                           |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |                                                                                                                                                                           |  |  |
| <b>Root Cause</b><br><div style="display: flex; justify-content: space-between;"> <div>             Environment <input type="checkbox"/><br/>             Design <input type="checkbox"/><br/>             Doc/Data <input type="checkbox"/><br/>             Equip/Tooling <input type="checkbox"/><br/>             Handling/Pre <input type="checkbox"/><br/>             Material <input type="checkbox"/><br/>             Internal Transport <input type="checkbox"/><br/>             Tribal Knowledge <input type="checkbox"/><br/>             LOA <input type="checkbox"/><br/>             Substation <input type="checkbox"/><br/>             Past Expiry Date <input type="checkbox"/><br/>             Misidentified <input type="checkbox"/> </div> <div>             No Re-verification <input type="checkbox"/><br/>             Operator <input type="checkbox"/><br/>             Offset/Setup <input type="checkbox"/><br/>             Supplier <input type="checkbox"/><br/>             Training <input type="checkbox"/><br/>             Use for Testing <input type="checkbox"/><br/>             Poor Information <input type="checkbox"/><br/>             Rushing <input type="checkbox"/><br/>             Product Improvement <input type="checkbox"/><br/>             Process Improvement <input type="checkbox"/><br/>             Manufacturing Process <input type="checkbox"/><br/>             Past Due <input type="checkbox"/> </div> </div> |  | <b>FAULT CATEGORY</b><br><div style="display: flex; justify-content: space-between;"> <div>             Pressure/Forced <input type="checkbox"/><br/>             Bending <input type="checkbox"/><br/>             Centre Not Concentric <input type="checkbox"/><br/>             Cracks <input type="checkbox"/><br/>             Crimp/Kink/Ripple/Wave <input type="checkbox"/><br/>             Cuffs <input type="checkbox"/><br/>             Crushing <input type="checkbox"/><br/>             Heat Treat <input type="checkbox"/><br/>             Wave/Twist in Tube <input type="checkbox"/><br/>             Marks/Chatter <input type="checkbox"/> </div> <div>             Temperature/Cure <input type="checkbox"/><br/>             Set-up <input type="checkbox"/><br/>             BOM/Route <input type="checkbox"/><br/>             Broken/Damage/Defect <input type="checkbox"/><br/>             Inspection Incomplete/Unqualified <input type="checkbox"/><br/>             Contamination <input type="checkbox"/><br/>             Countersink <input type="checkbox"/><br/>             Cut Too Short <input type="checkbox"/><br/>             Instructions Incomplete/Unclear <input type="checkbox"/><br/>             Drill Holes <input type="checkbox"/> </div> <div>             Power Loss/Surge <input type="checkbox"/><br/>             Folio/Program <input type="checkbox"/><br/>             Grain <input type="checkbox"/><br/>             Weld <input type="checkbox"/><br/>             Wrong Stock Pulled <input type="checkbox"/><br/>             Out of Sequence <input type="checkbox"/><br/>             Off-set <input type="checkbox"/><br/>             Misabeled <input type="checkbox"/><br/>             Fit/Function <input type="checkbox"/><br/>             Misaligned/off center <input type="checkbox"/> </div> <div>             Positioned Wrong <input type="checkbox"/><br/>             Outside Dimensions <input type="checkbox"/><br/>             Over/Under tolerance <input type="checkbox"/><br/>             Part Incorrect <input type="checkbox"/><br/>             Part Lost/Missing <input type="checkbox"/><br/>             Part Moved <input type="checkbox"/><br/>             Drawing <input type="checkbox"/><br/>             Finish <input type="checkbox"/><br/>             Misread <input type="checkbox"/><br/>             Turning Sequence <input type="checkbox"/> </div> </div> |  | OTHER : _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |                                                                                                                                                                           |  |  |

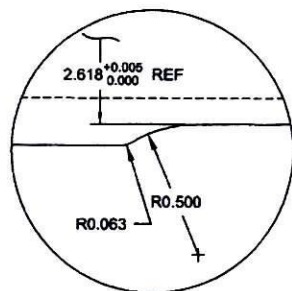




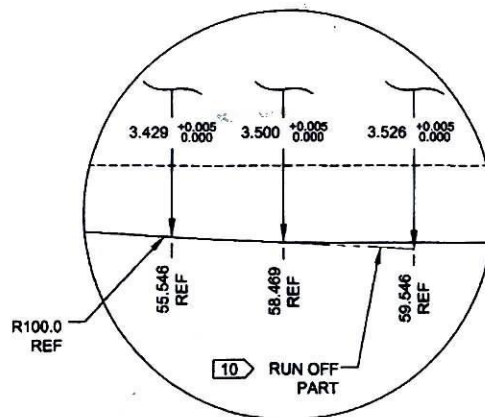
**D412-664-243TRN**  
**TURNING DETAIL**



**DETAIL E:**  
**CROSSTUBE CUFF**  
SCALE 5X



**DETAIL G:**  
**CUFF TRANSITION**  
SCALE 10X



**DETAIL F:**  
**TAPER RUN-OFF**  
NOT TO SCALE

**RELEASED**  
2014-05-26

|                                                                                                                                                                                                                                |                                                                                       |                                        |              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|--------------|
| DESIGN                                                                                                                                                                                                                         |  | <b>DART AEROSPACE LTD</b>              |              |
| DRAWN                                                                                                                                                                                                                          |  | HAWKESBURY, ONTARIO, CANADA            |              |
| CHECKED                                                                                                                                                                                                                        |  | DRAWING NO.                            | REV. F       |
| MFG. APPR.                                                                                                                                                                                                                     |  | D412-664-243                           | SHEET 4 OF 4 |
| APPROVED                                                                                                                                                                                                                       |  | TITLE                                  | SCALE        |
| DE APPR.                                                                                                                                                                                                                       |  | CROSSTUBE ASSEMBLY (412 HI AFT)        | NTS          |
| DATE                                                                                                                                                                                                                           | 14.04.01                                                                              | COPYRIGHT © 2001 BY DART AEROSPACE LTD |              |
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DQA: \_\_\_\_\_ Date: \_\_\_\_\_



## WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: \_\_\_\_\_ Date: \_\_\_\_\_

Work Order update only ☐

|                                                              |                                                |                                                                                                                                                                                    |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |  |                       |                                              |  |
|--------------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--|-----------------------|----------------------------------------------|--|
| Work Order: _____<br><br>Part No. _____<br><br>NCR No. _____ |                                                | <b>DISPOSITION</b><br><br>Rework <input type="checkbox"/><br>Scrap <input type="checkbox"/><br>Use-as-is <input type="checkbox"/><br>Suspected Unapproved <input type="checkbox"/> |                                                            | <b>AGAINST DEPARTMENT/PROCESS</b><br><br><div style="display: flex; justify-content: space-between;"> <div>           Skid-tube <input type="checkbox"/><br/>           Machining <input type="checkbox"/><br/>           Thermoforming <input type="checkbox"/><br/>           Large Fab <input type="checkbox"/> </div> <div>           Cross tube <input type="checkbox"/><br/>           Small Fab <input type="checkbox"/><br/>           Finishing <input type="checkbox"/><br/>           Composite <input type="checkbox"/> </div> <div>           Water Jet <input type="checkbox"/><br/>           Prod. Eng. Coord. <input type="checkbox"/><br/>           Rec/Store/Packaging <input type="checkbox"/><br/>           Supplier <input type="checkbox"/> </div> <div>           Engineering <input type="checkbox"/><br/>           Quality <input type="checkbox"/><br/>           Other <input type="checkbox"/> </div> </div> |                                               |  |                       |                                              |  |
| Date :                                                       |                                                | Step #:                                                                                                                                                                            |                                                            | QTY Effective :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |  | MRB (QSI042) Approval |                                              |  |
| Description Work Order Deviation                             |                                                |                                                                                                                                                                                    |                                                            | Disposition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                               |  |                       | Completed By                                 |  |
|                                                              |                                                |                                                                                                                                                                                    |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |  |                       | Lead hand / Supervisor Approval Verification |  |
|                                                              |                                                |                                                                                                                                                                                    |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |  |                       | QC / QA Coordinator Approval                 |  |
|                                                              |                                                |                                                                                                                                                                                    |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |  |                       |                                              |  |
| <b>Root Cause</b>                                            |                                                | <b>FAULT CATEGORY</b>                                                                                                                                                              |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |  |                       |                                              |  |
| Environment <input type="checkbox"/>                         | No Re-verification <input type="checkbox"/>    | Pressure/Forced <input type="checkbox"/>                                                                                                                                           | Temperature/Cure <input type="checkbox"/>                  | Power Loss/Surge <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Positioned Wrong <input type="checkbox"/>     |  |                       |                                              |  |
| Design <input type="checkbox"/>                              | Operator <input type="checkbox"/>              | Bending <input type="checkbox"/>                                                                                                                                                   | Set-up <input type="checkbox"/>                            | Folio/Program <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Outside Dimensions <input type="checkbox"/>   |  |                       |                                              |  |
| Doc/Data <input type="checkbox"/>                            | Offset/Setup <input type="checkbox"/>          | Centre Not Concentric <input type="checkbox"/>                                                                                                                                     | BOM/Route <input type="checkbox"/>                         | Grain <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Over/Under tolerance <input type="checkbox"/> |  |                       |                                              |  |
| Equip/Tooling <input type="checkbox"/>                       | Supplier <input type="checkbox"/>              | Cracks <input type="checkbox"/>                                                                                                                                                    | Broken/Damage/Defect <input type="checkbox"/>              | Weld <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Part Incorrect <input type="checkbox"/>       |  |                       |                                              |  |
| Handling/Pre <input type="checkbox"/>                        | Training <input type="checkbox"/>              | Crimp/Kink/Ripple/Wave <input type="checkbox"/>                                                                                                                                    | Inspection Incomplete/Unqualified <input type="checkbox"/> | Wrong Stock Pulled <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Part Lost/Missing <input type="checkbox"/>    |  |                       |                                              |  |
| Material <input type="checkbox"/>                            | Use for Testing <input type="checkbox"/>       | Cuffs <input type="checkbox"/>                                                                                                                                                     | Contamination <input type="checkbox"/>                     | Out of Sequence <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Part Moved <input type="checkbox"/>           |  |                       |                                              |  |
| Internal Transport <input type="checkbox"/>                  | Poor Information <input type="checkbox"/>      | Crushing <input type="checkbox"/>                                                                                                                                                  | Countersink <input type="checkbox"/>                       | Off-set <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Drawing <input type="checkbox"/>              |  |                       |                                              |  |
| Tribal Knowledge <input type="checkbox"/>                    | Rushing <input type="checkbox"/>               | Heat Treat <input type="checkbox"/>                                                                                                                                                | Cut Too Short <input type="checkbox"/>                     | Mislabeled <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Finish <input type="checkbox"/>               |  |                       |                                              |  |
| LOA <input type="checkbox"/>                                 | Product Improvement <input type="checkbox"/>   | Wave/Twist in Tube <input type="checkbox"/>                                                                                                                                        | Instructions Incomplete/Unclear <input type="checkbox"/>   | Fit/Function <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Misread <input type="checkbox"/>              |  |                       |                                              |  |
| Substation <input type="checkbox"/>                          | Process Improvement <input type="checkbox"/>   | Marks/Chatter <input type="checkbox"/>                                                                                                                                             | Drill Holes <input type="checkbox"/>                       | Misaligned/off center <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Turning Sequence <input type="checkbox"/>     |  |                       |                                              |  |
| Past Expiry Date <input type="checkbox"/>                    | Manufacturing Process <input type="checkbox"/> | OTHER : _____                                                                                                                                                                      |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |  |                       |                                              |  |
| Misidentified <input type="checkbox"/>                       | Past Due <input type="checkbox"/>              |                                                                                                                                                                                    |                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |  |                       |                                              |  |